Division Copy

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

WARTIME REPORT

ORIGINALLY ISSUED

September 1942 as
Restricted Bulletin

COMPARISON OF TIGHTNESS OF 78° MACHINE-COUNTERSUNK RIVETS DRIVEN IN HOLES PREPARED WITH 78° AND 82° COUNTERSINKING TOOLS

By Robert Gottlieb and Merven W. Mandel

Langley Memorial Aeronautical Laboratory
Langley Field, Va.

NACA

WASHINGTON

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESTRICTED BULLETIN

COMPARISON OF TIGHTNESS OF 78° MACHINE-COUNTERSUNK RIVETS DRIVEN IN HOLES PREPARED WITH 78° AND 82° COUNTERSINKING TOOLS

By Robert Gottlieb and Merven W. Mandel

In the investigation of machine-countersunk rivets for aircraft reported in reference 1, it was shown that tight rivets are obtained if the rivet head projects above the skin surface before driving and that loose rivets are obtained if the rivet head lies below the skin surface before driving. In the preparation of the specimens for the investigation of reference 1, 78° rivets and an 82° machine-countersinking tool were used. The present paper gives the results of a supplementary study undertaken to determine whether the use of a 78° countersinking tool instead of an 82° countersinking tool would substantially alter the foregoing conclusion.

The specimens for this study consisted of two sheets of 24S-T aluminum alloy riveted together in the form of a lap joint with two 1/8-inch-diameter A17S-T aluminum-alloy rivets, as shown in figure 1. The nominal height of the manufactured countersunk head of the rivets was 0.046 inch. The riveting procedure used was that described in reference 1 as method C, wherein the manufactured countersunk head of the rivet is driven with a vibrating gun while the shank end is bucked with a bar.

The height of the rivet head above or below the skin surface before driving is designated h_b, positive when the rivet head is above the skin surface and negative when the rivet head is below the skin surface.

The testing procedure was the same as that used in the investigation of reference 1.

RESULTS

It was concluded in reference 1 that a comparison of the quality of machine-countersunk riveted joints on the basis of maximum load alone is not justified; the yield load as a measure of tightness is a better criterion of the strength quality of a flush-riveted joint. The yield load is defined as the shear load per rivet for which the sheets are permanently displaced an amount equal to 4 percent of the rivet diameter. This definition is arbitrary and corresponds, in a measure, to the arbitrary definition of yield point commonly specified for aircraft materials.

The effect of h_b on yield load and maximum load is shown in figure 2 for the three sheet thicknesses used. This figure indicates that although the use of the 78° countersinking tool instead of the 82° countersinking tool increases the yield load slightly, the effect is too small to be of any practical importance. The general conclusion of reference 1, that increasing h_b in the positive direction increases the yield strength, is not altered.

The band of scatter for the test data of reference 1, obtained with 0.040-inch sheet and rivets with head heights of 0.064 inch, is shown by dashed lines in figure 2. The fact that the yield loads for the specimens reported herein plot within this band indicates that the change to a head height of 0.046 inch caused no appreciable change in the yield strength.

Langley Memorial Aeronautical Laboratory
National Advisory Committee for Aeronautics,
Langley Field, Va.

REFERENCE

1. Lundquist, Eugene E., and Gottlieb, Robert: A Study of the Tightness and Flushness of Machine-Countersunk Rivets for Aircraft. NACA R.B., June 1942.

L-252

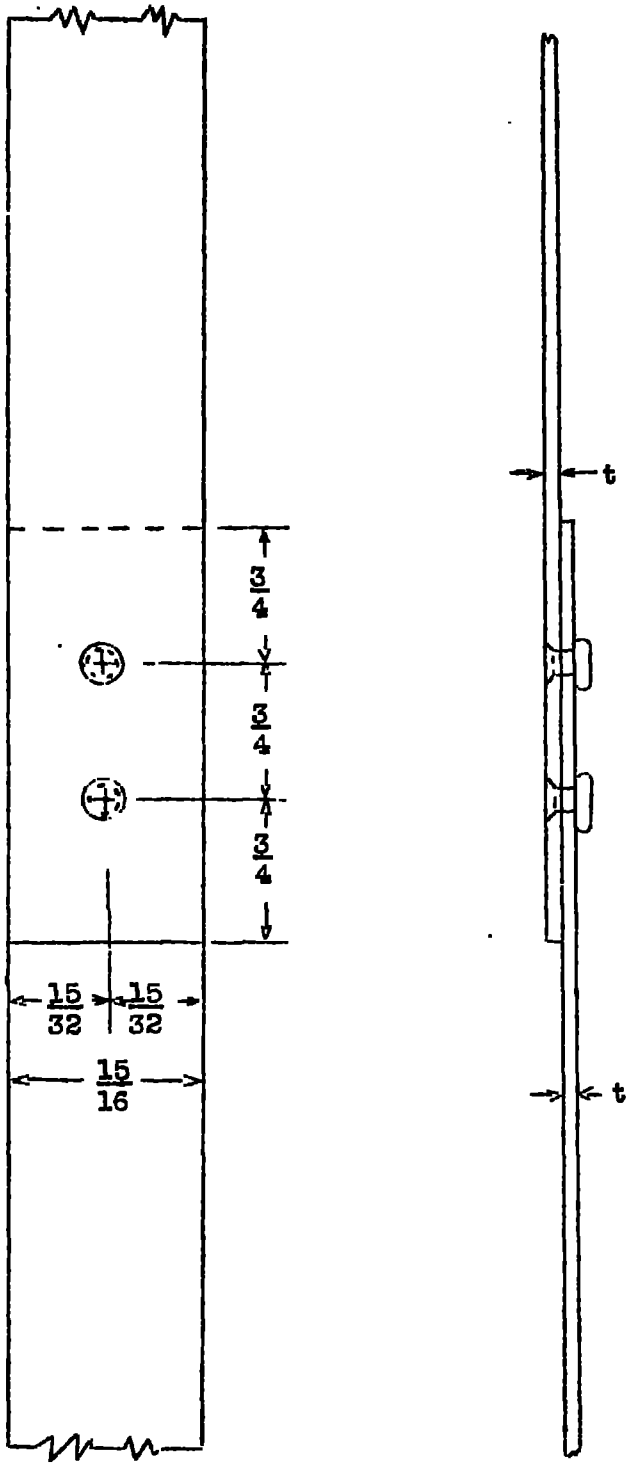

Figure 1.- Test specimen.

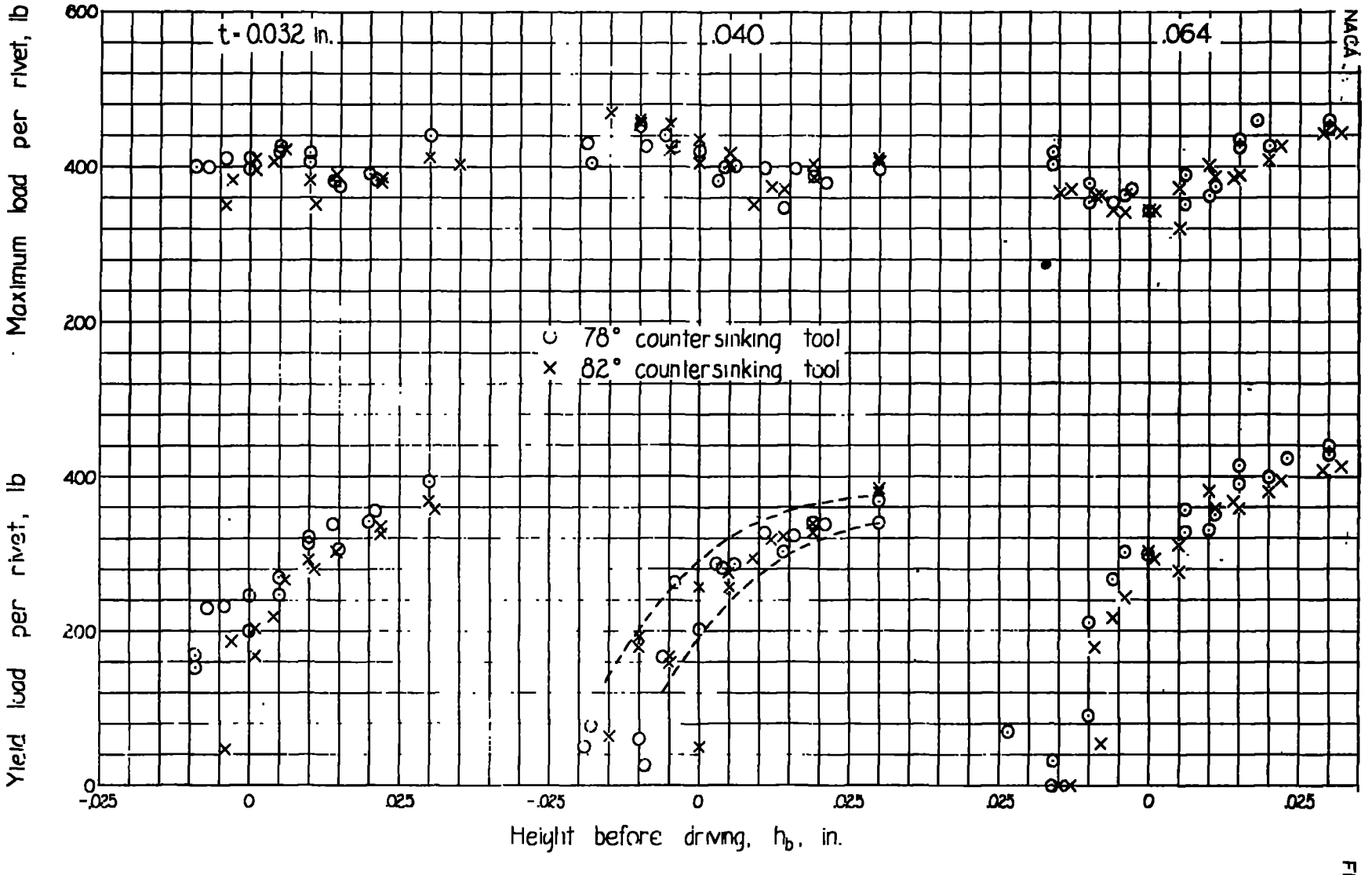

Figure 2 - Comparison of yield and maximum loads for 78° machine-countersunk rivets driven in holes prepared with 78° and 82° countersinking tools

Fig. 2